REMARKS

Applicants respectfully request that the above application be reconsidered in view of the above amendments and the following remarks, which are believed to place the application in condition for allowance.

Claims 1, 2, 5-14, and 16-30 are currently pending. Claims 21-30 have been withdrawn from consideration.

Claims 1, 4 and 14 have been amended to specify that the ions are implanted into the surface of the component as disclosed in the next-to-the-last line of paragraph [0018] of the specification.

Claim 1 has also been amended to specify that the rotor component is a compressor or turbine disk or seal element as in claim 2, which has been canceled; is made of a nickel-base alloy as disclosed in paragraph [0004] of the specification; and has a service operating temperature of from about 540°C to about 815°C as in claim 3, which has been canceled.

Claim 14 has also been amended to clarify that the rotor component is a turbine engine rotor component, as described in the preamble of the claim.

Claim 14 has also been amended to specify that the rotor component is made of a nickel-base alloy as disclosed in paragraph [0004] of the specification; and has a service operating temperature of from about 540°C to about 815°C as in claim 15, which has been canceled.

No new matter is introduced by the above amendments, and it is requested that they be entered.

A. Restriction Requirement Under 35 USC 121

Pursuant to 35 USC 121, the Examiner states that restriction to one of the following inventions is required:

I. Claims 1-20, drawn to a method for improving corrosion resistance, classified in class 427, subclass 523.

II. Claims 21-30, drawn to a turbine engine rotor component, classified in class 428, subclass 632.

Referring to MPEP 806.05(f), the Examiner states that these inventions are distinct because the product may be made by a materially different process from Claims 1-20. Specifically, it is said that the product may be made by vapor deposition, sputtering, or spray to

produce structure equivalent to those produced by ion implantation processes. It is stated that because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes is proper.

As requested by the Examiner, this confirms the provisional election of the invention of Group I, drawn to method Claims 1-20. Applicants also respectfully request that the Examiner reconsider and withdraw this restriction requirement. MPEP Section 803 states:

> "If the search and examination of an entire application can be made without serious burden, the Examiner must examine it on the merits, even though it includes claims to distinct or independent inventions."

Other than referring to different patent classifications for Inventions I and II, no other basis is provided for why searching both inventions would be difficult or burdensome. Moreover, Applicants do not know and thus do not agree that the product of claims 21-30 can be made by the other methods described by the Examiner. Accordingly, Applicants respectfully request that the restriction requirement be withdrawn and that Inventions I and II as defined by Claims 1-30 be examined together.

B. Rejection of Claims 1-20 Under 35 USC 112 as Being Indefinite

Claims 1-20 have been rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. As suggested by the Examiner and disclosed in paragraph [0018], Claims 1, 4 and 14 have been amended to specify that the ions are implanted into the surface of the component. It is believed this amendment also resolves the Examiner's comments about this issue in Claims 5 and 14. Accordingly, reconsideration and withdrawal of this rejection is requested.

Claim 14 is also said to be unclear regarding because the body of the claim in part (a) refers to a "rotor component". In response thereto, this portion of the claim has been amended to specify "turbine engine rotor component" to match the language in the preamble. It is believed that this amendment fully overcomes the Examiner's rejection of Claim 14 and objection to the specification. Applicants' usage of the "turbine engine rotor component" is consistent in the

specification, including the paragraphs cited by the Examiner. Accordingly, it is requested that this rejection be withdrawn.

C. Rejection of Claims 1 and 4 under 35 USC 102(b) as being anticipated by Murakami et al. (JP 62-174377)

As amended, Applicants' Claim 1 specifies that the turbine engine rotor component is a compressor or turbine disk or seal element made of a nickel-base alloy and having a service operating temperature of from about 540°C to about 815°C. As described in paragraph [0004] of the specification, such disks and seal elements are made of nickel-base superalloys selected for good elevated temperature strength and fatigue resistance. However, these disks and seal elements may not have sufficient resistance to oxidation and corrosion damage at the high operating temperatures being encountered. As described in paragraph [0005] of the specification, such disks and seal elements typically have not been coated to protect them against oxidation and corrosion. While various oxidation-resistant and corrosion-resistant coatings have been used on turbine blades, such coatings are generally too thick and heavy for use on disks and seal elements, and may adversely affect fatigue life of disks and seal elements.

Murakami discloses implanting ions into turbine vanes. As acknowledged by the Examiner, Murakami does not disclose disks or seal elements as in the present invention. Moreover, Murakami's vanes are Al or Ti alloys reinforced with ceramic fibers, not nickel-base alloys having a service operating temperature of from about 540°C to about 815°C, as in the present invention. Thus, Murakami does not anticipate Claims 1 and 4, and it is requested that this rejection be withdrawn.

D. Rejection of Claim 2 under 35 USC 102(b) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over Murakami et al., optionally considering Naik (US 4,919,773) or Bedell et al (GB 2241961 A) or Manty et al. (US 4,433,005)

As noted above, Claim 1 has been amended to incorporate the limits of Claim 2, which has been canceled. For the reasons stated above, Murakami does not anticipate Claim 1. As also noted above, disks and seal elements typically have not been coated to protect them against oxidation and corrosion as done with turbine blades. Such coatings of blades are generally too thick and heavy for use on disks and seal elements, and also may adversely affect fatigue life of

disks and seal elements. Murakami does not suggest that its ion implantation of fiber-reinforced Al or Ti alloy vanes could or should be used on nickel-base alloys useful as disks and seal elements, which have a service operating temperature of from about 540°C to about 815°C, as in the present invention.

The Naik, Bedell, and Manty secondary references all relate to coatings on turbine and compressor blades. As noted in the cited portions of Naik, Bedell and Manty, these are titanium alloys, not nickel-base alloys useful as disks and seal element, as in the present invention. None of these references disclose disks and seal elements made of nickel alloys. Thus, these secondary references add little or nothing to support the rejection of Claim 1 based on Murakami. Accordingly, it is submitted that Claim 1 would not have been obvious over Murakami, optionally considering Naik or Bedell or Manty, and it is requested that this rejection be withdrawn.

E. Rejection of Claims 1 and 7-8 under 35 USC 102(b) as being anticipated by Dodd et al.

As note above, Applicants' Claim 1 specifies that the turbine engine rotor component is a compressor or turbine disk or seal element made of a nickel-base alloy and having a service operating temperature of from about 540°C to about 815°C.

Dodd does not disclose ion implantation of such a disk or seal element. Thus, Dodd does not anticipate Claims 1 and 7-8, and it is requested that this rejection be withdrawn.

F. Rejection of Claim 2 under 35 USC 102(b) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over Dodd et al., optionally considering Naik or Bedell et al or Manty et al

As noted above, Claim 1 has been amended to incorporate the limits of Claim 2, which has been canceled. For the reasons stated above, Dodd does not anticipate Claim 1. As also noted above, disks and seal elements typically have not been coated to protect them against oxidation and corrosion as done with turbine blades. Such coatings of blades are generally too thick and heavy for use on disks and seal elements, and also may adversely affect fatigue life of disks and seal elements. Dodd does not suggest that its ion implantation of turbine bearings could or should be used on nickel-base alloys useful as disks and seal elements, which have a service operating temperature of from about 540°C to about 815°C, as in the present invention.

The Naik, Bedell, and Manty secondary references all relate to coatings on turbine and compressor blades. As noted in the cited portions of Naik, Bedell and Manty, these are titanium alloys, not nickel-base alloys useful as disks and seal element, as in the present invention. None of these references disclose disks and seal elements made of nickel alloys. Thus, these secondary references add little or nothing to support the rejection of Claim 1 based on Dodd. Accordingly, it is submitted that Claim 1 would not have been obvious over Dodd, optionally considering Naik or Bedell or Manty, and it is requested that this rejection be withdrawn.

G. Rejection of Claims 5-6 and 9 under 35 USC 103(a) as being unpatentable over Dodd et al.

As noted above, Claim 1 would not have been obvious over Dodd. Moreover, as acknowledged by the Examiner, Dodd does not teach the depth of implantation into the surface as required by Applicants' Claims 5, 6 and 9. Accordingly, it is submitted that these claims would not have been obvious over Dodd, and it is requested that this rejection be withdrawn.

H. Rejection of Claims 3 and 5-9 under 35 USC 103(a) as being unpatentable over Murakami et al. in view of Dodd et al. and/or Baty et al (EP 0240110 A1)

As noted above, Claim 1 has been amended to incorporate the limits of Claim 3, which has been canceled. For the reasons stated above, Claim 1 would not have been obvious over Murakami in view of Dodd. Baty relates to ion implantation of metal alloys such as zirconium. Baty does not disclose disks and seal elements made of nickel alloys. Thus, Baty adds little or nothing to support the rejection of based on Murakami and Dodd. Accordingly, it is submitted that Claims 1 and 5-9 would not have been obvious over Murakami in view of Dodd and/or Baty, and it is requested that this rejection be withdrawn.

I. Rejection of Claims 10-11 under 35 USC 103(a) as being unpatentable over Murakami et al or Dodd et al as applied to Claims 1-2 and 3-9, or 1 and 5-9 respectively above, and further in view of Baty et al

For the reasons stated above, Claim 1 would not have been obvious over Murakami or Dodd in view of Baty. It is thus requested that this rejection of dependent Claims 10-11 be withdrawn.

J. Rejection of Claims 1 and 4 under 35 USC 102(b) as being anticipated by Schaeffer et al. (US 5,780,110)

As amended, Applicants' Claim 1 specifies that the turbine engine rotor component is a compressor or turbine disk or seal element made of a nickel-base alloy and having a service operating temperature of from about 540°C to about 815°C. As described in paragraph [0004] of the specification, such disks and seal elements are made of nickel-base superalloys selected for good elevated temperature strength and fatigue resistance. However, these disks and seal elements may not have sufficient resistance to oxidation and corrosion damage at the high operating temperatures being encountered. As described in paragraph [0005] of the specificathon, such disks and seal elements typically have not been coated to protect them against oxidation and corrosion. While various oxidation-resist'nt and corrosion-resistant coatings have been used on turbine blades, such coatings are generally too thick and heavy for use on disks and seal elements, and may adversely affect fatigue life of disks and seal elements.

Schaeffer discloses surface doping of bond coats on turbine blades. Schaeffer does not disclose disks or seal elements as in the present invention. Moreover, in Applicants' invention, the aluminum or chromium ions are implanted into the surface of the disk or seal element, not into bond coats on turbine blades. Thus, Schaeffer does not anticipate Claims 1 and 4, and it is requested that this rejection be withdrawn.

K. Rejection of Claim 2 under 35 USC 102(b) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over Schaeffer et al. considering Naik or Bedell et al or Manty et al.

As noted above, Claim 1 has been amended to incorporate the limits of Claim 2, which has been canceled. For the reasons stated above, Schaeffer does not anticipate Claim 1. As also

noted above, disks and seal elements typically have not been coated to protect them against oxidation and corrosion as done with turbine blades. Such coatings of blades are generally too thick and heavy for use on disks and seal elements, and also may adversely affect fatigue life of disks and seal elements. Schaeffer does not suggest that its ion implantation of turbine bearings could or should be used on nickel-base alloys useful as disks and seal elements, which have a service operating temperature of from about 540°C to about 815°C, as in the present invention.

The Naik, Bedell, and Manty secondary references all relate to coatings on turbine and compressor blades. As noted in the cited portions of Naik, Bedell and Manty, these are titanium alloys, not nickel-base alloys useful as disks and seal element, as in the present invention. None of these references disclose disks and seal elements made of nickel alloys. Thus, these secondary references add little or nothing to support the rejection of Claim 1 based on Schaeffer. Accordingly, it is submitted that Claim 1 would not have been obvious over Schaeffer, optionally considering Naik or Bedell or Manty, and it is requested that this rejection be withdrawn.

L. Rejection of Claims 2-3 and 5-9 under 35 USC 103(a) as being unpatentable over Schaeffer et al.

As noted above, Claim 1 has been amended to incorporate the limits of Claims 2 and 3, which have been canceled. For the reasons stated above, it is submitted that Claims 1 and 5-9 would not have been obvious over Schaeffer, and it is requested that this rejection be withdrawn.

M. Rejection of Claims 2 and 12-20 under 35 USC 103(a) as being unpatentable over Murakami et al as applied to claims 1-2 and 2-9 above, and further in view of Schaeffer et al. or Hayashi et al (JP 02-015164) and optionally further in view of Weimer et al (U.S. 6,532,657 B1)

As noted above, Claim 1 has been amended to incorporate the limits of Claim 2, which has been canceled. For the reasons stated above, Claim 1 would not have been obvious over Murakami or obvious over Schaeffer. Hayashi relates to ion implantation of metal alloys such as Ti or Ti alloys. Hayashi does not disclose disks and seal elements made of nickel alloys. Weimer does not disclose implantation of aluminum or chromium ions into the surface of the disk or seal elements. Thus, Hayashi and Weimer add little or nothing to support the rejection of claims based on Murakami. Accordingly, it is submitted that Claims 1 and 12-20 would not have

been obvious over Murakami in view of Schaeffer or Hayashi or Weimer, and it is requested that this rejection be withdrawn.

N. Rejection of Claims 1 and 4-6 under 35 USC 102(e) as being anticipated by Darolia et al (U.S. 6,617,049 B2 or U.S. 6,632,480 B2) or Rigney et al. (U.S. 6,620,525 B1)

As amended, Applicants' Claim 1 specifies that the turbine engine rotor component is a compressor or turbine disk or seal element made of a nickel-base alloy and having a service operating temperature of from about 540°C to about 815°C. The above-cited patents relate to various thermal or overlay coatings for turbine engine components. As also noted above, disks and seal elements typically have not been coated to protect them against oxidation and corrosion as done with turbine blades. Such coatings of blades are generally too thick and heavy for use on disks and seal elements, and also may adversely affect fatigue life of disks and seal elements. Thus, the cited references do not anticipate Claims 1 and 4-6, and it is requested that this rejection be withdrawn.

O. Rejection of Claims 2-3 and 6-9 under 35 USC 103 (a) as being unpatentable over Darolia et al (U.S. 6,617,049 B2 or U.S. 6,632,480 B2) or Rigney et al, (U.S. 6,620,525 B1) optionally view of Weimer et al

As amended, Applicants' Claim 1 specifies that the turbine engine rotor component is a compressor or turbine disk or seal element made of a nickel-base alloy and having a service operating temperature of from about 540°C to about 815°C. The above-cited patents relate to various thermal or overlay coatings for turbine engine components. As also noted above, disks and seal elements typically have not been coated to protect them against oxidation and corrosion as done with turbine blades. Such coatings of blades are generally too thick and heavy for use on disks and seal elements, and also may adversely affect fatigue life of disks and seal elements. Thus, Claims 1 and 6-9 would not have been obvious over the cited references, and it is requested that this rejection be withdrawn.

P. Rejection of Claims 1, 3 and 4-5 under 35 USC 102(b) as anticipated by or in the alternative, under 35 USC 103(a) as obvious over Rigney et al. (U.S. 6,282,714 B1)

As amended, Applicants' Claim 1 specifies that the turbine engine rotor component is a compressor or turbine disk or seal element made of a nickel-base alloy and having a service operating temperature of from about 540°C to about 815°C. Rigney relates to various diffusion or overlay coatings for turbine engine blades. As also noted above, disks and seal elements typically have not been coated to protect them against oxidation and corrosion as done with turbine blades. Such coatings of blades are generally too thick and heavy for use on disks and seal elements, and also may adversely affect fatigue life of disks and seal elements. Thus, Rigney does not anticipate or render obvious Claims 1 and 4-5 (claim 3 has been canceled, as noted above), and it is requested that this rejection be withdrawn.

Q. Rejection of Claims 2 and 6-9 under 35 USC 103(a) as being unpatentable over Rigney et al (U.S. 6,282,714 B1) optionally view of Weimer et al.

As noted above, Claim 1 has been amended to incorporate the limits of Claim 2, which has been canceled. For the reasons stated above, Claim 1 would not have been obvious over Rigney or obvious over Rigney in view of Weimer, which does not disclose implantation of aluminum or chromium ions into the surface of the disk or seal elements. Accordingly, it is submitted that Claims 1 and 6-9 would not have been obvious over Rigney or Weimer, and it is requested that this rejection be withdrawn.

R. Rejection of Claims 1-5 and 7 under 35 USC 102(e) as being anticipated by Zhao et al (U.S. 6,964,791 B2)

As amended, Applicants' Claim 1 specifies that the turbine engine rotor component is a compressor or turbine disk or seal element made of a nickel-base alloy and having a service operating temperature of from about 540°C to about 815°C. Zhao relate to various coatings for turbine engine components. As also noted above, disks and seal elements typically have not been coated to protect them against oxidation and corrosion as done with turbine blades. Such coatings of blades are generally too thick and heavy for use on disks and seal elements, and also may adversely affect fatigue life of disks and seal elements. Thus, the cited references do not anticipate Claims 1-5 and 7, and it is requested that this rejection be withdrawn.

S. Rejection of Claims 6 and 8-9 under 35 USC 103(a) as being anticipated by Zhao et al.

For the reasons stated above, Claim 1 would not have been obvious over Zhao, which does not disclose implantation of aluminum or chromium ions into the surface of the disk or seal elements. Accordingly, it is submitted that Claims 6 and 8-9 would not have been obvious over Zhao, and it is requested that this rejection be withdrawn.

T. Rejection of Claims 1-9 under obviousness-type double patenting over Claims 1-29 of U.S. Patent No. 6,964,791 B2 (Zhao et al)

For the reasons stated above, Claim 1 would not have been obvious over Zhao, which does not disclose implantation of aluminum or chromium ions into the surface of the disk or seal elements. Accordingly, it is submitted that Claims 1 and 4-9 would not have been obvious over Zhao, and it is requested that this rejection be withdrawn.

U. Conclusion

It is believed that the above represents a complete response to the Examiner's rejections and places the application in condition for allowance. Accordingly, reconsideration and allowance of Claims 1, 2, 5-14, and 16-30 is respectfully requested.

Applicants would appreciate a telephone call should the Examiner have any questions or comments with respect to this response.

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